

TAXONOMY OF THE *SIDA RHOMBIFOLIA* (MALVACEAE) COMPLEX IN INDIA

V.V. SIVARAJAN and A.K. PRADEEP

Department of Botany
University of Calicut
Kerala 673 635, INDIA

ABSTRACT

The *Sida rhombifolia* complex in India is revised. *Sida rhomboidea* and *S. scabrida* are reinstated as distinct species; *S. retusa*, also reinstated as a distinct species, is treated under the older name *S. alnifolia*. An artificial key for identification, amended synonymy, descriptions, and illustrations are provided.

RESUMEN

Se revisa el complejo *Sida rhombifolia* en la India. *S. rhomboidea* y *S. scabrida* son restablecidas como especies diferentes; *S. retusa*, también restablecida como especie diferente, se trata bajo el nombre más antiguo de *S. alnifolia*. Se ofrecen una clave artificial para la identificación, sinonimias corregidas, descripciones e ilustraciones.

The genus *Sida* L. is taxonomically difficult. Among its species, *S. rhombifolia* continues to be the hardest nut of all. There is great diversity of opinion as to its circumscription. Even as a world-wide revision of the genus is still wanting, we have tended to consider this species as a highly polymorphic taxon including widely different elements from different areas. The result is that classifications proposed for one region, say for Malesia (Borssum Waalkes 1966), Nigeria (Ugborogho 1980), Mexico (Fryxell 1988), China (Hu 1955), and Taiwan (Chang 1977), are not applicable to Indian elements. This makes the current taxonomy of the species a little suspect and it seems that the very concept of species needs change. From the treatments of the complex available, it seems that defining the species in this complex into well characterized, easily identifiable units on narrower lines would be of greater service than dumping everything into a vague and hazy *S. rhombifolia*. This is the idea that emerged during a critical and exhaustive study of the Indian elements during a revisionary study of the Malvaceae of the area.

Sida rhombifolia, as it is understood at present, is one of the most variable and widely distributed species of the genus and has been given some 30 binomials by different taxonomists (Ugborogho 1980). Linnaeus (1753, 1763) described three species now included in this complex, namely *S. rhombifolia*, *S. alnifolia*, and *S. retusa*, all from India. Cavanilles (1785) added *S. alba*, *S. canescens*, *S. microphylla*, and *S. orientalis*, and De Candolle (1824) recognized *S. capensis*, *S. philippica*, *S. planicaulis*, and *S. schrankii*. That was

the time when the species had narrower definitions, but they were soon rejected in favor of a broad concept; consequently most such species were sunk into synonymy of a broad *S. rhombifolia* or were recognized as subspecific taxa under it.

It was Masters (1874) who broadened the definition of the species; he recognized five different varieties of it in India. Schumann (1892) recognized six varieties in Brazil "because he had no clear idea what *S. rhombifolia* sens. str. was" (Fryxell, pers. comm.). A similar course followed by Baker (1892) and, for the African elements, by Hutchinson and Dalziel (1958), who recognized three varieties of this species in Africa. Borssum Waalkes (1966), working on Malesian Malvaceae, elevated var. *rhombifolia* and var. *retusa* into subspecies and reduced all other binomials into synonymy. This is the treatment widely followed at present. Subsequently, Hatusima (1971) recognized another new subspecies (subsp. *insularis*) in the Philippines; this was later reported also from Taiwan (Chang 1977). Ugborogho (1980) kept *S. retusa* and *S. alnifolia* as two different subspecies in Nigeria.

The classification of this complex becomes all the more difficult because taxonomists differ among themselves in its circumscription. For example, *S. orientalis* Cav. has been included in *S. rhombifolia* by some (e.g., Rao 1985), but others treat it as a synonym of *S. acuta* (Borssum Waalkes 1966). The most confusing part of all is that very different elements from different parts of the world have been treated under the same name by different authors. Thus *S. alba* L. is actually *S. spinosa* L., but *S. alba* Cav. is *S. rhombifolia*. To add to the trouble, Paul and Nayar (1988) treated *S. alba* L. and *S. spinosa* L. as two different species. So also, *S. alnifolia* L., widely accepted as conspecific with *S. retusa* L., is kept distinct by Ugborogho (1980), who recognized three subspecies in the *S. rhombifolia* complex in Nigeria, namely, subsp. *rhombifolia*, subsp. *alnifolia*, and subsp. *retusa*. From his descriptions and plates, it is obvious that he treated at least the two latter taxa in a sense different from that of Linnaeus, because both of them seem to belong to subsp. *rhombifolia* (sensu Borssum Waalkes, 1966). It is pertinent to quote here the comments of Marais (1983) on this: "He uses some names in a sense other than that of van Borssum Waalkes and myself ... the photographs of the mericarps of *S. rhombifolia* sens. lat. (p. 83 Fig. 6) are so poorly reproduced that it is impossible to comment on his application of the three Linnaean epithets" (i.e., *rhombifolia*, *alnifolia*, and *retusa*).

We undertake here a revision of this complex. We have not been able to study it from the entire range because of difficulties in procuring materials and literature. Instead, we have confined ourselves to the Indian elements.

Linnaeus (1753) described *S. rhombifolia* as "*Sida foliis lanceolato-rhomboidibus serratis*" and *S. alnifolia* as "*Sida foliis orbicularis plicatis serratis*." Later, he described another species, *S. retusa* (Linnaeus 1763), as

"*Sida foliis cuneiformibus retusis, serratis subtus tomentosis.*" He described all these taxa based on Indian specimens; while describing *S. retusa*, he indicated that it is very close to *S. alnifolia* ("Varietarum *S. alnifoliae* statuit Dillenius, mihi distincta visa est"). These three taxa have now been lectotypified (*S. rhombifolia*: lectotype 2. rhombifolia LINN 866. 3, BM–Fryxell 1988; *S. alnifolia*: lectotype Herb. Herm. III fol. 4. *Linn.* 260. BM–Borssum Waalkes 1966; *S. retusa*: lectotype *Linn.* 866.7, LINN–Borssum Waalkes 1966). We have now studied all these (as photographs) along with Indian specimens and relevant literature and are convinced that *S. alnifolia* L. and *S. retusa* L. are conspecific.

Sida alba, another name often reduced to the synonymy of *S. rhombifolia*, was originally described by Linnaeus (1763) as "*Sida foliis cordatis subrotundis, stipulis setaceis, axillis trispinosis*" based on Indian material (lectotype H.U. Herb. *Linn.* 866.2). He also indicated its close kinship with *S. spinosa* ("Similissima *S. spinosae*, sed folia rotunda flores albi, stigmatibus purpureis; petiolarum apices purpurascens tota demum planta major"). Consequently, most authors have reduced it to synonymy of *S. spinosa* (Masters 1874; Borssum Waalkes 1966; Ugborogho 1980; Fryxell 1988). But Paul and Nayar (1988), in their revision of Indian Malvaceae, treated *S. alba* and *S. spinosa* as separate species based on presence or absence of stipular spines. We studied the types of *S. spinosa* (Lectotype: Herb. *Linn.* 866.1, LINN) and that of *S. alba* L. (l.c.). They differ mainly in shape of leaves, probably due to morphological plasticity (as also acknowledged by Ugborogho 1980) and in stipular spines. However, "the subpetiolar spine (better: spur) is quite variable in expression (even from one node to the next of a given plant!) and its presence or absence is of little taxonomic value. Moreover, it sometimes occurs on several other unrelated species, at least in South America" (Fryxell, pers. comm., 6 Sep 1993). Our observations on Indian specimens endorse Fryxell's viewpoint. These spines usually occur on the woody branches of older plants. The Linnaean specimen is, most likely, a young plant where spines have not yet developed. Otherwise, his *S. spinosa* and *S. alba* are identical and hence conspecific.

Cavanilles, however, (1785) seems to have attributed the name *S. alba* to a different Indian plant (type: MA, Photo BM, not seen), which is now widely accepted as conspecific with *S. rhombifolia*.

Sida obovata Wall. and *S. microphylla* Cav. from Bengal are two other names often associated with *S. rhombifolia*. In fact, Masters (1874) recognized them as two different varieties of the same species. We have not been able to study the type of the latter (*Sonnerat s.n.*, P), but Paul and Nayar (1988) studied it, concluding that it is nothing but a smaller form of *S. rhombifolia*. We have, however, been able to study the type of *S. obovata* Wall. (lectotype, Wall. Cat. 1864 from Burma, K). It is a very distinctive plant with obovate-obtuse

leaves and long-peduncled, somewhat racemose, axillary inflorescences, which character combination is not known anywhere in the *S. rhombifolia* complex. In the absence of more material, we are not able to comment upon its exact identity, but are almost certain that its place is not in this complex.

In his classification of this complex, Masters (1874) recognized five varieties of *S. rhombifolia* in the Indian subcontinent, i.e., var. *scabrida*, var. *retusa*, var. *rhomboidea*, var. *obovata*, and var. *microphylla*; we have already eliminated the last two from the present consideration. Subsequently Borssum Waalkes (1966) found that Malesian materials of this complex fall under two groups, *S. rhombifolia* and *S. retusa*, distinguishable by habit, leaf shape, flower size, and some other characters, which he has dealt with in detail (Borssum Waalkes 1953). He also observed that, though the taxa are sympatric, they do not interbreed and produce hybrids in nature (Borssum Waalkes 1966). Consequently, he rejected Masters' treatment ("the differences between the groups are several, they cannot merely be regarded as varieties") and gave them the rank of subspecies. But his subsp. *rhombifolia*, still, is very highly polymorphic, including in it *S. scabrida* and *S. rhomboidea*.

After a critical study of living populations and herbarium specimens we are still at a loss to understand why we cannot consider *S. retusa* to be a species distinct from *S. rhombifolia*, in the strict sense of Linnaeus. The differences between the two, Backer (1943), Borssum Waalkes (1953, 1966), listed by Masters (1874), and Ridley (1922), are substantial and adequate for specific separation, notwithstanding the muddling by Ugborogho (1980: 65–75); their reproductive isolation renders them good "biological" species. We reinstate *S. retusa* as a species different from *S. rhombifolia*.

But one of the problems that usually crops up in distinguishing *S. retusa* is that taxonomists often rely too much on leaf characters, especially the retuse leaf apex, but this character is not unique to this taxon; an unambiguous classification would not be possible unless we correlate it with mericarp features. Dr. Fryxell, while commenting on this manuscript (pers. comm.), wrote, "I have six specimens in my herbarium, of which three (from India and Ceylon) have muticous mericarps (in agreement with your description), but the other three have long spines (to 3 mm) on the mericarps. These specimens are from Malaysia and two from the Philippines. All have pubescent fruits." The awns of the mericarps are evident in the Malaysian specimen (*Worthington* 13027 UTEP, pf), a photocopy of which Dr. Fryxell kindly sent to us. However, after consulting the type of *S. retusa* and other Indian specimens, we are of the opinion that the Malaysian and the Philippine materials belong elsewhere than to *S. retusa*. But there is a nomenclatural problem involved.

It was already mentioned that *S. alnifolia* and *S. retusa* are conspecific, the epithet "alnifolia" antedating the latter. There is technically nothing wrong with Borssum Waalkes' (1966) adoption of the later epithet "retusa" for the

subspecies, because a name does not have priority outside its own rank (ICBN Art. 60), but he has also rightly suggested that “in case this taxon is considered a distinct species, it should be named as *S. alnifolia* L.” So, we treat this taxon under the earlier name.

Since the publication of *S. rhombifolia* by Linnaeus (1753), Fleming (1810) described yet another, closely related Indian species under the name *S. rhomboidea*, based on a specimen named by Roxburgh (see Borssum Waalkes 1966: 197; Fryxell 1988: 403). Fleming (1810) and Roxburgh (1832) described it as differing from *S. rhombifolia* “in the arils having no horns.” But Wallich, apparently, attributed this name to a different plant (Wall. Cat. 1862 F) and observed that Roxburgh’s plant is *S. rhombifolia* (distinguished by the two long awns on the mericarps) (cf. Wight & Arnott 1834). It is probably from this time on that *S. rhomboidea* has been included in synonymy of the latter. However, Wight and Arnott (1834: 58) studied Roxburgh’s figures and material cultivated in the Calcutta Garden by Roxburgh and concluded that they are different from Wallich’s *S. rhombifolia*. Borssum Waalkes (1966: 197) also made a critical study of these and concluded that “Wallich’s specimen is obviously misidentified.” He, in turn, designated the two specimens at Brussels (s. loc., s. coll., no. 2228, photographs seen) as the lectotype of *S. rhomboidea*.

Sida rhomboidea is widely distributed in India, and we had ample opportunities to study it in the field and laboratory and to compare it with *S. rhombifolia* L. (s.s), which is also plentiful. They differ substantially in several respects, of which fruit characters are most striking. In the case of *S. rhombifolia*, the schizocarps are prominently beaked at the apex with the projecting awns of the mericarps. The mericarps, each with two long awns, dehisce at the apex, exposing part of the seed before dispersal and they separate from each other even as the fruits remain on the plants. In the case of *S. rhomboidea*, however, the schizocarps are depressed, somewhat umbilicated at top, as described by Roxburgh (1832), but not beaked. The mericarps are rather indehiscent, with a beak at apex (not 2-awned). They cohere together closely and are shed as a single unit by articulation of the pedicel, the mericarps separating much later. From our observations here, it is obvious that *S. rhomboidea* is a distinct taxon, morphologically and apparently reproductively isolated from *S. rhombifolia* and that it deserves to be treated as a distinct species on its own as has been done by Fleming (1810), Roxburgh (1832), and Wight and Arnott (1834), instead of drowning it in a highly polymorphic *S. rhombifolia*. *Sida rhomboidea* seems to be more akin to *S. unicornis* Marais from Mauritius. It differs in its glabrous mericarps with obtuse or retuse beaks, whereas *S. unicornis* is characterized by pubescent mericarps with sharp-pointed beak.

Sida scabrida was originally described as "whole plants sprinkled with rigid, simple or 2–3 (or more) partite hairs ... leaves rhomboid or oblong, lanceolate ... without tomentum ... pedicels jointed at the very base; carpels 9–11, bicuspidate" (Wight & Arnott 1834:57), based on the peninsular Indian specimen Wight 166 (K, CAL). We have collected and studied several specimens that perfectly match the type (photograph seen). Apparently, it is close to *S. rhombifolia*, so much so that Masters (1874) and Paul and Nayar (1988) treated it as a variety of the latter. But it differs from *S. rhombifolia* (s.s.) in a number of characters, notably in the indumentum, coarse pubescence of leaves, calyces etc. Apart from that, the mericarps in *S. scabrida* are stellate-pubescent while those of *S. rhombifolia* are glabrous.

Sida scabrida also closely resembles *S. yunnanensis* Hu, with which it might easily be confused. But the former is characterized by adpressed simple hairs on the upper surface of leaves, pedicels articulated at base or not at all, and 7–10 mericarps in contrast to the stellate hairs on the upper surface of leaves, pedicels articulated above the middle, and 6–7 mericarps, in *S. yunnanensis*.

Now the question arises whether these are sufficient reasons for segregating *S. scabrida* as a distinct species or whether we should retain it as a variety of *S. rhombifolia*. The answer will have to focus on the manner of delimitation of species in the entire genus. With a circumtropical distribution and wide-ranging variability, species delimitation here has been based on a few character differences with, of course, support from apparent reproductive isolation. In this context, *S. scabrida* qualifies well for species status and so we are reinstating it as distinct.

Our studies on vegetative features (from seedling stage to adult plants) and reproductive characters, especially mericarp morphology (Sivarajan et al. 1992), reveal that in India we have at least four distinct species, i.e., *S. rhombifolia* (s.s.), *S. alnifolia*, *S. scabrida*, and *S. rhomboidea*, which have been hitherto included in *S. rhombifolia* (s.l.). Amended descriptions and synonymy of these taxa are given below.

KEY TO SPECIES

- 1a. Adaxial surface of leaves with appressed simple hairs, abaxial surface coarsely pubescent with simple and 2–3(5)-rayed stellate hairs; pedicels jointed at very base or not jointed 4. *S. scabrida*
- 1b. Adaxial surface of leaves without simple hairs, abaxial surface densely pubescent with many-rayed stellate hairs; pedicels jointed at about middle 2
- 2a. Lower leaves always obovate, retuse or truncate at apex; mericarps minutely stellate-pubescent, mucronate at apex, mucros obtuse, retuse, or emarginate at apex. 1. *S. alnifolia*
- 2b. Lower leaves not obovate, retuse or truncate at apex; mericarps glabrous, 2-awned or beaked 3

- 3a. Staminal column stellate-pubescent; mericarps beaked with a single, muticous process, indehiscent 3. *S. rhomboidea*
 3b. Staminal column glabrous; mericarps prominently 2-awned, apically dehiscent 2. *S. rhombifolia*

1. *Sida alnifolia* L., Sp. Pl. 684. 1753. (Fig. 1). TYPE: Herb. Herm. Ill. fol. 4. *Linn.* 260 (LECTOTYPE: BM); Wight & Arn., Prodr. Fl. Pen. Ind. Or. 1:58. 1834.

Sida retusa L. Sp. Pl. 961. 1763. TYPE: Herb. *Linn.* 866.7, LINN; Wight & Arn., Prodr. Fl. Pen. Ind. Or. 1:58. 1834.

S. rhombifolia var. *retusa* (L.) Mast. in Hook. f., Fl. Brit. India 1:324. 1874; Trimen, Handb. Fl. Ceylon 1:143. 1893.

S. rhombifolia subsp. *retusa* (L.) Borss., Blumea 14:198. 1966; Mani. & Sivar., Fl. Calicut 44. 1982; Sald. & Ramesh in Sald., Fl. Karnataka 1:260. 1984; Paul & Nayar, in Nayar et al. (eds.), Fasc. Fl. India 19:216. 1988, non Ugborogho 1980.

S. rhombifolia subsp. *alnifolia* Ugborogho, Bol. Soc. Brot. Ser. 54:70. 1980.

Woody herbs or subshrubs to 50 cm, usually low and strongly branched; stems prostrate or ascending, terete, green or purplish grey, stellate-tomentose to glabrescent. Leaf blades 0.5–5 × 0.5–4 cm, leaves towards stem base always obovate with retuse or emarginate apex, rarely truncate, upper leaves obovate to elliptic-lanceolate with rounded, subobtuse or acute apex, obtuse or rounded at base, margins irregularly serrate-dentate or crenate distally, entire proximally, upper surface sparsely pubescent with short many-rayed stellate hairs, lower surface densely greyish tomentose with short, many-rayed stellate hairs; petiole 3–5 mm long, stellate-pubescent, shortly pulvinulate below blade; stipules 4.5 mm long, equal, linear to subulate, glabrescent. Flowers axillary, solitary, sometimes in terminal clusters due to reduction of distal leaves; pedicels longer than petioles, 3–4 mm long in flower, to 30 mm in fruit, glabrous, jointed about middle; calyx 6–7 mm diameter, 6 mm long, pubescent with minute stellate hairs, glabrous within, 5-lobed, lobes 2 mm long, ovate-triangular; corolla 12 mm diameter, orange yellow, petals 7.8 × 6.5 cm, obliquely obovate, cuneate at apex, glabrous except for minutely hairy base; staminal column 3 mm long, glabrous or minutely stellate-hairy, antheriferous at apex; ovary 1.5 mm diameter, depressed globose, glabrous; styles 7–10, white; stigmas capitate, creamy-yellow. Mericarps 7–10, 2.5–1.5 mm, included in calyx, reticulate or rugose on sides and back, apex with a pair of short stellate-hairy mucros, mucros obtuse, retuse, or emarginate at apex. Seeds 2 mm long, black, glabrous except for puberulent hilum.

Distribution and Ecology. *Sida alnifolia* is widely distributed in the plains and hills of Southern Peninsular India, and occurs along Ghat roadsides, forest clearings as secondary growth, lateritic hill slopes, and occasionally as a weed in upland cultivation. It flowers from August to April in Kerala. The flowers open at about 0900 am and wither by 1400.

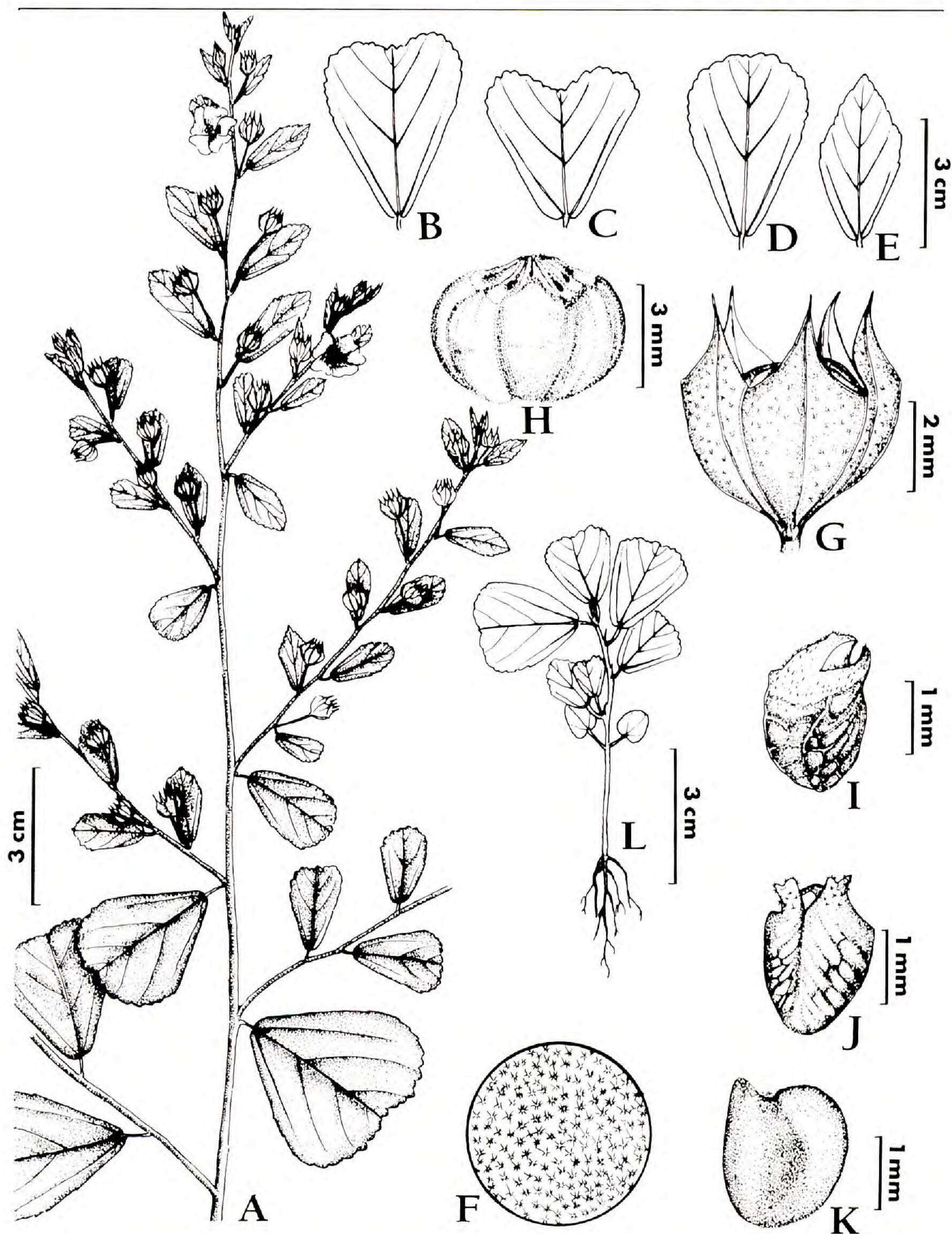


FIG. 1. *Sida alnifolia*. A. Flowering branch; B–E. Range of leaf variation; F. Indumentum; G. Schizocarp with accrescent calyx; H. Schizocarp with calyx removed; I–J. Mericarps, lateral and frontal view; K. Seed; L. Seedling.

Specimens examined: ANDHRA PRADESH: Cuddapah Dt.: without precise locality, *Barber* 4634 (MH). Guntur Dt.: without precise locality, *Barber* 4632 (MH). East Godavari Dt.: Bison Hill, *Barber* 5104 (MH).

KARNATAKA: Chikmangalur Dt.: Santaveri, *Pradeep* 47732 (CALI). Dakshin Kannad

Dt.: Sullia, *Barber* 2095 (MH); Uduppi, *Pradeep* 5060 (pf); Nalgody-Kutajadri road, *Pradeep* 5041 (CALI). **Kodagu Dt.:** Sampaji, *Barber* 2209 (MH). **Uttar Kannad Dt.:** Karwar, *Pradeep* 5017, 5018; Shrunkeri, *Pradeep* 5025B; Jogfalls, *Pradeep* 5041 (CALI).

KERALA: **Idukki Dt.:** Munnar, *Vivekanandan* 48577 (MH). **Kannur Dt.:** Kannothe R.F., *Ramachandran* 57700 (MH). **Kottayam Dt.:** Kumaramperoor R.F., *Subramanian* 8246 (FRC). **Kozhikode Dt.:** Kadalundi, *Pradeep* 5013; Badagara, *Pradeep* 5025 (CALI). **Palakkad Dt.:** Dhony, *Pradeep* 5268 (CALI); *Sebastian* 21092 (MH); *Venkatasubramanian & Sasidharan* 10650 (FRC). **Thrissur Dt.:** Peringalkuth, *Pradeep* 5228 (CALI); Peechi, *Subramanian* 9322 (FRC). **Wynad Dt.:** Tariodu R.F., *Pradeep* 51617 (CALI).

TAMIL NADU. **Coimbatore Dt.:** Maruthamalai, *Sebastian* 721 (MH); *Fischer* 2017 (FRC); *Pradeep* 5238, 50429 (CALI). **Kottabomman Dt.:** Tirunelveli, *Barber* 535 (MH). **Nilgiri Dt.:** Theppakad, *Vivekanandan* 43051 (MH). **Ramanathapuram Dt.:** Srivilliputhur, *Srinivasan* 72378 (MH). **Salem Dt.:** Hunasur cattle farm, *Narayanaswami* 2925 (MH).

2. *Sida rhombifolia* L., Sp. Pl. 684. 1753. (Fig. 2). TYPE: “2 *rhombifolia*” (LECTOTYPE: LINN - 866.3; ISOLECTOTYPE: S); Roxb., *Fl. Ind.* ed. Carey 3:176. 1832; Mast. in Hook. f., *Fl. Brit. India* 1:323. 1874, in part; Trimen, *Handb. Fl. Ceylon* 1:143. 1893, excl. var. 3 *retusa*; Dunn in Gamble, *Fl. Pres. Madras* 1:90. 1915; Ramam. in Sald. & Nicolson, *Fl. Hassan Dt.* 155. 1976; Britto & Matthew in Matthew, *Fl. Tam. Carnatic* 3:131. 1983, in part; Fryxell, *Syst. Bot. Monogr.* 25:403. 1988, in part, excl. syn. *S. rhomboidea*; Mani., *Fl. Silent Valley* 28. 1988, in part., Vajravelu, *Fl. Palghat Dt.* 84. 1990, in part, excl. syn. vars. *obovata*, *retusa* & *rhomboidea*.

Sida rhombifolia subsp. *rhombifolia*: Borss., *Blumea* 14:193. 1966; Mani. & Sivar., *Fl. Calicut* 44. 1982; Sald. & Ramesh in Sald., *Fl. Karnataka* 1: 259. 1984 (all in part, excl. syn. *S. rhomboidea*).

S. rhombifolia subsp. *rhombifolia* var. *rhombifolia*: Paul & Nayar in Nayar et al. (eds.), *Fasc. Fl. India* 19:214. 1988.

S. alba Cav., *Diss. I.* 22.t. 3.f.8. 1785, non Linn., 1763.

Erect branched undershrubs to 1 m tall; stems terete, green or purplish, cinereous with many-armed short-stellate hairs. Leaf blades 5–6 × 2–2.5 cm, elliptic to rhomboid, rounded to truncate at base, 3-nerved, serrate distally, entire towards base, upper surface green, glabrescent, lower surface densely cinereous with short-stellate hairs, appearing farinaceous; petiole 5–6 mm long, densely pubescent, shortly pulvinulate at both ends; stipules up to 5 mm long, equal linear-lanceolate, 1-nerved, margins simple-hairy. Flowers axillary, solitary, sometimes in apparent racemes due to reduction of upper leaves; pedicels 0.5–1 cm long in flower, to 5 cm in fruit, glabrous, articulated above middle; calyx 5–6 mm diameter, campanulate, 10-ribbed at base, pubescent, 5-lobed, lobes 3 mm long, triangular, apex acute-acuminate, externally pubescent with short-stellate and simple hairs, glabrous within; corolla 1 cm diameter, pale yellow or creamy-white, veins sometimes tinged with red at center; petals 9–10 × 6–7 mm, obliquely obovate, truncate or cuneate at apex, short stellate-hairy or glabrous at base; staminal column 3 mm long, glabrous, antheriferous at apex; ovary 1.5 mm diameter, conical, glabrous; styles 8–10; stigmas capitate, yellow or pale pink. Meri-

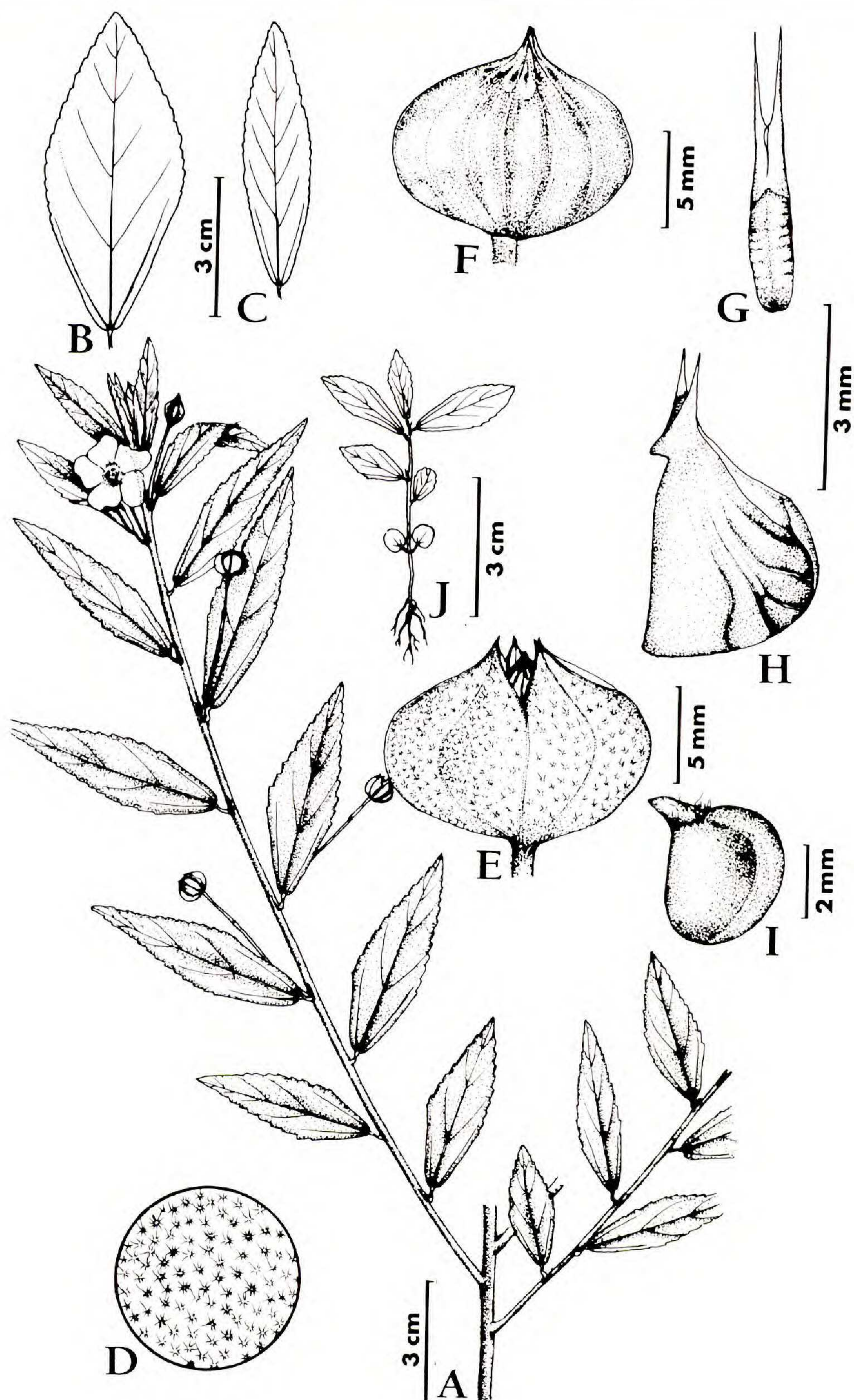


FIG. 2. *Sida rhombifolia*. A. Flowering branch; B–C. Range of leaf variation; D. Indumentum; E. Schizocarp with accrescent calyx; F. Schizocarp with calyx removed; G–H. Mericarps, dorsal and lateral view; I. Seed; J. Seedling.

carps 8–10, 4×3 mm, included in calyx, trigonous with acute angles, pale when mature, distinctly and transversely rugose on sides and back; apex with a pair of short, glabrous, divergent awns 1–1.5 mm long (as long or slightly shorter than calyx). Seeds 2 mm long, black, minutely hairy at hilum.

Distribution and Ecology. *Sida rhombifolia* is almost world-wide in distribution, occurring throughout the tropics of both the Old and New worlds and extending into temperate zones (Fryxell 1988). It is common throughout India and occurs along roadsides and wastelands at altitudes from 1000 to 2000 m. It flowers almost throughout the year, the flowers opening late in the morning, usually between 1045 and 1100.

Specimens examined. KERALA: Kottayam Dt.: Sabarigiri, *Sivarajan* 5211 (CALI). Thiruvananthapuram Dt.: Ponmudi, *Pradeep & Sivarajan* 50463 (CALI); Bonecaud, *Mohanan* 54732 (MH).

TAMIL NADU: Kanyakumari Dt.: Kothayar, *Pradeep* 44925, 44916 (CALI). Kattabomman Dt.: Courtallum, *Pradeep* 5105 (CALI).

3. *Sida rhomboidea* Roxb. ex Fleming, *Asiat. Res.* 11:178. 1810. (Fig. 3).

TYPE: s. loc., s. coll. 2228 (BR); Roxb., *Hort. Beng.* 50. 1814 & *Fl. Ind.* ed. Carey 3:176. 1832; Wight & Arn., *Prodr. Fl. Pen. Ind. Or.* 57. 1834; Dunn in Gamble, *Fl. Pres. Madras* 1:90. 1915.

Sida rhombifolia var. *rhomboidea* (Roxb. ex Fleming) Mast. in Hook. f., *Fl. Brit. India* 1:324. 1874.

S. rhombifolia subsp. *rhomboidea* sensu Borss., *Blumea* 14:193. 1966; Mani. & Sivar., *Fl. Calicut* 44. 1982; Sald. & Ramesh in Sald., *Fl. Karnataka* 1:259. 1984; Nair & Nayar, *Fl. Courtallum* 1:75. 1986; Fryxell, *Syst. Bot. Monogr.* 25:403. 1988; Mani., *Fl. Silent Valley* 28. 1988; Paul & Nayar in Nayar et al. (eds.), *Fasc. Fl. India* 19:214. 1988; Vajravelu, *Fl. Palghat Dt.* 84. 1990 (all in part).

Erect much branched subshrubs to 2.5 m tall; stems terete, usually purplish, minutely pubescent with small stellate hairs. Leaf blades on younger shoots much larger ($7-8 \times 5-6$ cm), obovate or suborbicular, truncate or rounded at base, subobtuse or acute at apex; those on flowering shoots smaller, $1-5 \times 0.5-3$ cm, rhomboid to lanceolate, 3-nerved from base, lateral nerves 3–5 pairs, nerves raised on lower surface, margins coarsely serrate to crenate, entire towards base, densely stellate-tomentose beneath, sparsely pubescent above; petiole 1–15 mm long, stellate-pubescent, shortly pulvinulate at both ends; stipules 9 mm long, equal, linear, slightly purplish, caducous. Flowers axillary, solitary; pedicels 6 mm in flower, to 30–40 mm in fruit, filiform, glabrous, articulated at about middle; calyx 9 mm diameter, campanulate, 10-ribbed at base, 5-lobed, lobes 3 mm long, triangular, outer surface densely tomentose with minute stellate hairs, inside nearly glabrous, margins purplish; corolla 1.5 cm diameter, pale yellow; petals $7-8 \times 5-6$ mm, obliquely obovate, retuse or emarginate at apex, glabrous; staminal column 3 mm long, stellate-pubescent, antheriferous at apex;

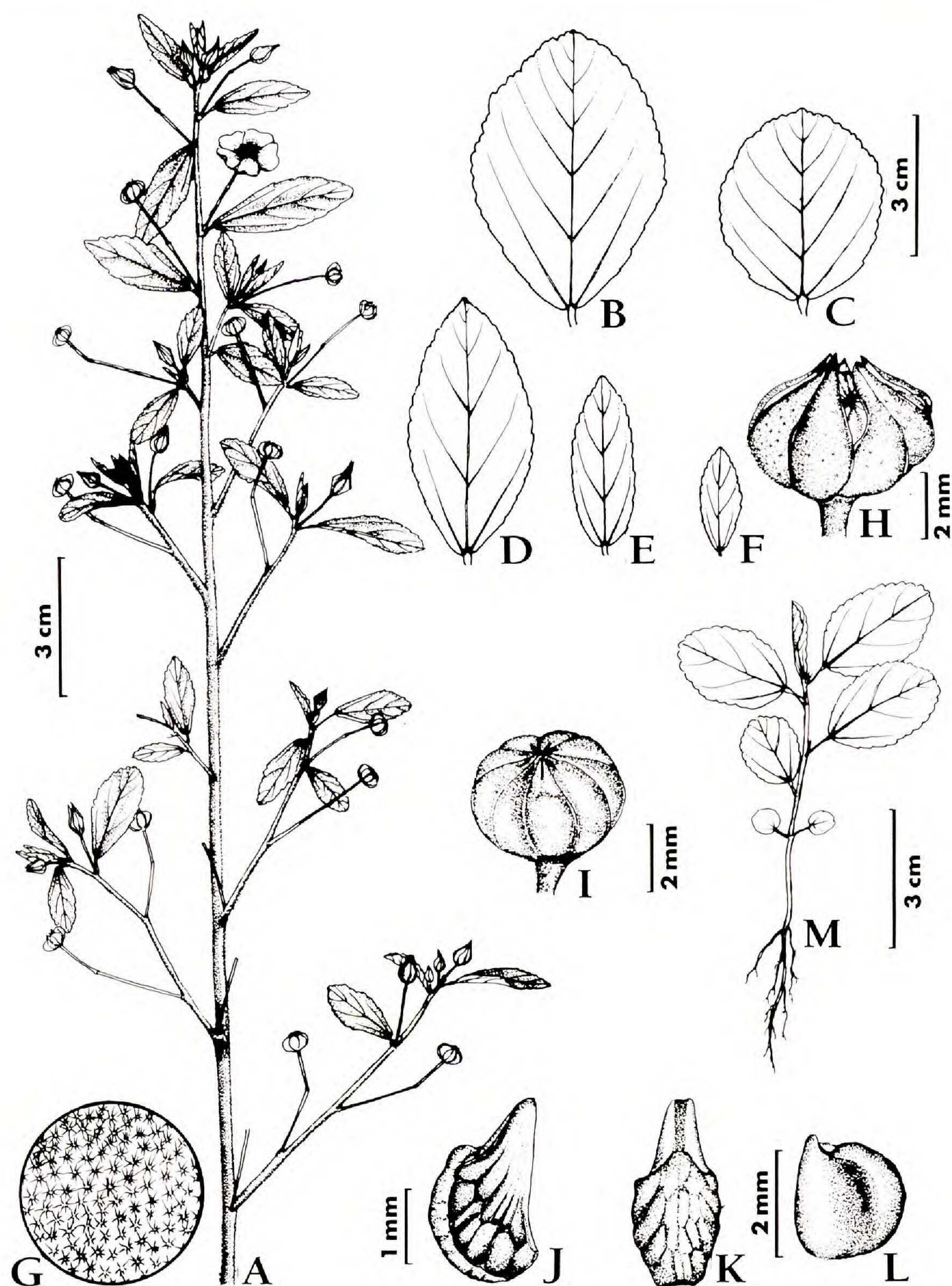


FIG. 3. *Sida rhomboidea*. A. Flowering and fruiting branch; B–F. Range of leaf variation; G. Indumentum; H. Schizocarp with accrescent calyx; I. Schizocarp with calyx removed; J–K. Mericarps, lateral and dorsal view; L. Seed; M. Seedling.

ovary 1.5 mm diameter, depressed globose, glabrous; styles 8–10; stigmas capitate, yellow. Mericarps 8–10, completely included in calyx, closely coherent, 3×2 mm, indehiscent, trigonous with acute angles, prominently reticulate on sides, reticulate or rugose on back, apex beaked with a single, glabrous mucous process. Seeds 2 mm long, brownish black, glabrous throughout.

Distribution and Ecology. *Sida rhomboidea* is common in the plains of Peninsular India. It occurs along roadsides and waste lands generally at sea level. Because of its frequent confusion with *S. rhombifolia*, it is difficult to draw conclusion on its distribution elsewhere, based on literature. The plant flowers almost throughout the year. The flowers open between 1045 and 1100 and wither by 1415.

Specimens examined. KERALA: Ernakulam Dt.: Wellington Island, *Pradeep* 5205; Cochin, *Pradeep* 5179 (CALI). Kannur Dt.: Tellicherry, Punnol, *Pradeep* 5107 (CALI). Kottayam Dt.: Changanacherry, *Antony* 904 (MH). Kozhikode Dt.: West Hill, *Pradeep* 5215, 6059; Devagiri, *Jayakumar* 884; Cheruvannur, *Sivarajan* 1482 (CALI). Malappuram Dt.: Parappanangadi, *Pradeep & Sivarajan* 5002 (CALI). Thiruvananthapuram Dt.: Bonecaud, *Mobanan* 63246 (MH).

TAMIL NADU: Ramanathapuram Dt.: *Vajravelu* 33853 (MH).

4. *Sida scabrida* Wight & Arn., Prodr. Fl. Pen. Ind. Or. 57. 1834. (Fig. 4).

TYPE: Peninsular India, *Wight* 166 (CAL, K.); Ugborogho, Bol. Soc. Brot., 54:100. 1980.

Sida rhombifolia var. *scabrida* (Wight & Arn.) Mast. in Hook. f., Fl. Brit. India 1:324. 1874.

S. rhombifolia subsp. *rhombifolia* var. *scabrida* (Wight & Arn.) Mast., Paul & Nayar in Nayar et al. (eds.), Fasc. Fl. India 19:216. 1988.

Erect branched subshrubs to 2 m tall; stems terete, green or slightly tinged with purple, pubescent with minute stellate hairs intermingled with scattered, long, simple hairs. Leaf blades 6–8 \times 3–4 cm, concolorous, rhomboid or oblong-lanceolate, truncate at base, acuminate at apex, basally 3-nerved, lateral nerves 4–5 pairs, margins serrate-crenate distally, entire towards base, coarsely pubescent on upper surface by appressed simple hairs, on lower surface with few scattered 2–3 armed stellate and simple hairs especially on the nerves, never with tomentum; petiole 0.5–1 cm long, pubescent with minute stellate and long simple hairs; stipules 4–6 mm long, subulate or filiform, ciliate. Flowers axillary, solitary, sometimes in clusters of 3–5 due to reduction of distal leaves. Pedicel up to 1 cm in flower, to 3 cm in fruit, not articulate; calyx 6–7 cm diameter, 10-ribbed at base, campanulate, 5-lobed, lobes 4 \times 4 mm, ovate, acuminate at apex; corolla 1.5 cm diameter, yellow; petals 1–12 \times 7–8 mm, minutely stellate-hairy at base; staminal column up to 3 mm long, stellate-pubescent; ovary ovoid, 2 mm

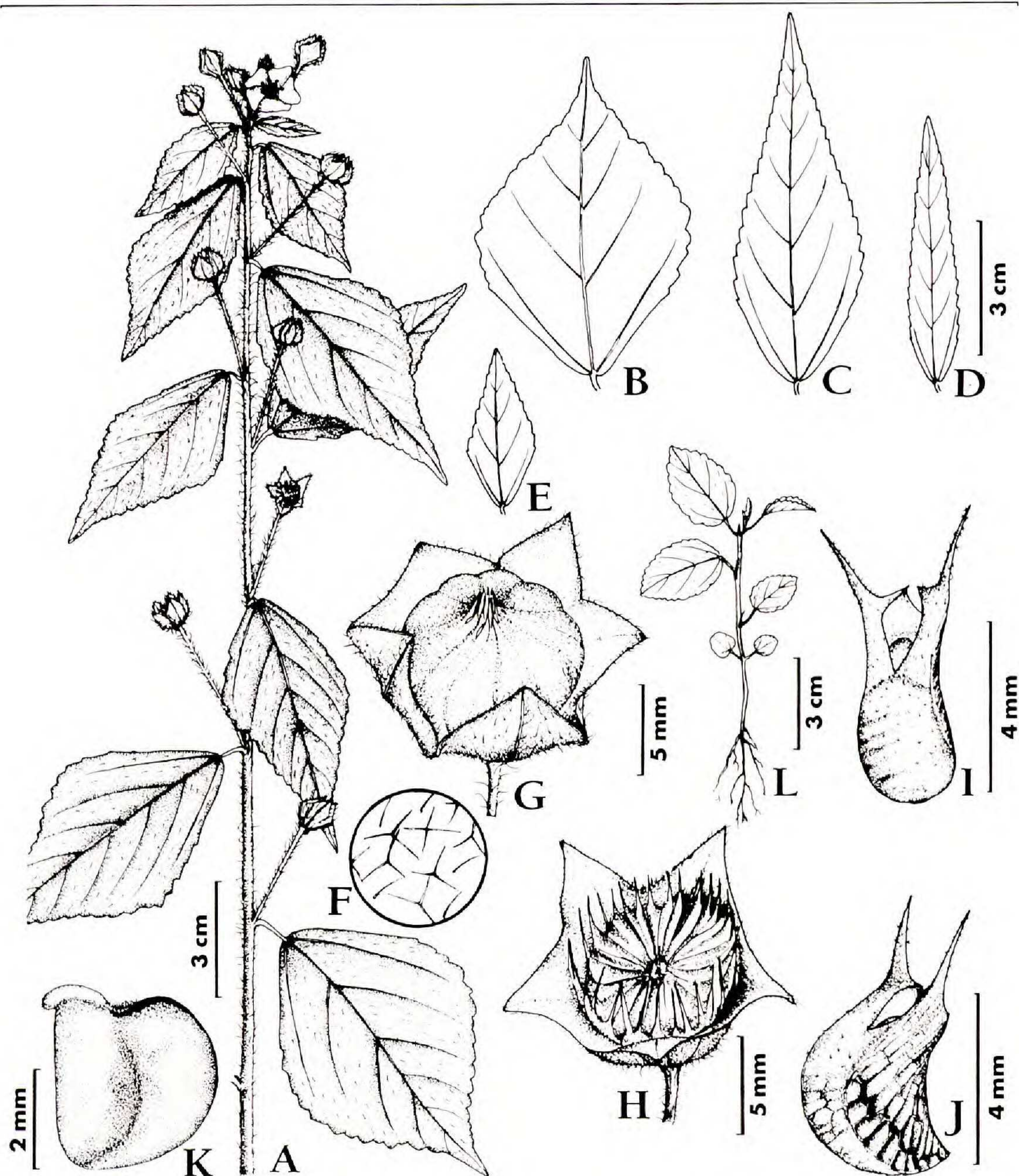


FIG. 4. *Sida scabrida*. A. Flowering and fruiting branch; B–E. Range of leaf variation; F. Indumentum; G. Schizocarp before dehiscence; H. Schizocarp showing dehiscence; I–J. Mericarps, dorsal and lateral view; K. Seed; L. Seedling.

diameter, minutely simple-hairy towards apex; styles 7–10; stigmas subglobose. Mericarps 7–10, 3×3 mm, enclosed in calyx, trigonous with acute angles, black when mature, minutely stellate-pubescent on back towards apex, prominently reticulate or transversely rugose on sides and back, apex with a pair of linear divergent simple and stellate-pubescent awns. Seeds 2 mm long, blackish or brown, pubescent at hilum.

Distribution and Ecology. *Sida scabrida* is known from Peninsular India

and (disjunctly) from Nigeria in Africa. It occurs in disturbed sites in evergreen, semi-evergreen, and moist deciduous forests. It also grows along roadsides generally at an altitude of 250–2000 m. The plant produces flowers principally from August–April. The flowers open between 1045 and 1100.

Specimens examined. KARNATAKA: Chikmagalur Dt.: Bababudan Hills, *Pradeep & Sivarajan* 47726 (CALI). Kodagu Dt.: Mercara, Sampaji, *Barber* 2315 (MH)

KERALA: Kottayam Dt.: Pampa, *Subramanian* 9969 (FRC). Kozhikode Dt.: Badagara, *Pradeep* 5101 (CALI, pf). Malappuram Dt.: Nedunkayam, *Pradeep & Sivarajan* 5097 (CALI). Palakkad Dt.: Silent Valley R.F., *Nair* 64374, *Vajravelu* 26103 (MH). Pathanamthitta Dt.: Moozhiyar, *Subramanian* 9620; *Mahadevan & party* 9193 (FRC); *Anil Kumar* 1513 (MH). Thiruvananthapuram Dt.: Ponmudi Hills, *Mohanan* 52542 (MH). Thrissur Dt.: Peringalkuthu, *Pradeep* 5227 (CALI). Wynad Dt.: Lakidy, *Pradeep* 5157, 5154; near Pookkottu lake, *Pradeep* 50457 (CALI); Chandanathode, *Ellis* 29438 (MH).

TAMIL NADU: Coimbatore Dt.: Attakkati-Valparai road, *Sivarajan Pradeep* 47761 (CALI). Kanyakumari Dt.: Kothayar, *Pradeep* 44929 (CALI). Nilgiri Dt.: Devala R.F., *Vajravelu* 42831; Kattaicombai, *Subramanyam* 1080; without precise locality, *Wight s.n.* (MH). Salem Dt.: Salem, *Deb* 31265 (MH).

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